

CLAIMS

1. A highly corrosion-resistant hot-dip galvanized steel product excellent in surface smoothness and formability, having on the steel product surface a zinc alloy plating layer composed of 4 to 10% by mass of Al, 1 to 5% by mass of Mg, up to 0.1% by mass of Ti and the balance of Zn and unavoidable impurities, the plating layer having a metal structure in which one or at least two of the [Al phase], [Zn₂Mg phase] and [Zn phase] are present in a mixture in the matrix of an [Al/Zn/Zn₂Mg ternary eutectic structure], and the plating layer containing a Ti-Al base intermetallic compound in one or at least two of the [Al phase], [Zn₂Mg phase] and [Zn phase].
2. A highly corrosion-resistant hot-dip galvanized steel product excellent in surface smoothness and formability, having on the steel product surface a zinc alloy plating layer composed of 4 to 22% by mass of Al, 1 to 5% by mass of Mg, up to 0.1% by mass of Ti, up to 0.5% by mass of Si and the balance of Zn and unavoidable impurities, the plating layer of the plated steel product having a metal structure in which an [Mg₂Si phase], an [Al phase] and a [Zn₂Mg phase] are present in a mixture in the matrix of an [Al/Zn/Zn₂Mg ternary eutectic structure], and the plating layer containing a Ti-Al base intermetallic compound in one or at least two of the [Al phase] and [Zn₂Mg phase].
3. A highly corrosion-resistant hot-dip galvanized steel product excellent in surface smoothness and formability, having on the steel product surface a zinc alloy plating layer composed of 4 to 22% by mass of Al, 1 to 5% by mass of Mg, up to 0.1% by mass of Ti, up to 0.5% by mass of Si and the balance of Zn and unavoidable impurities, the plating layer of the plated steel product having a metal structure in which an [Mg₂Si phase], an [Al phase], a [Zn₂Mg phase] and a [Zn phase] are present in a mixture in the matrix of an [Al/Zn/Zn₂Mg ternary eutectic

structure], and the plating layer containing a Ti-Al base intermetallic compound in one or at least two of the [Al phase], [Zn₂Mg phase] and [Zn phase].

5 4. A highly corrosion-resistant hot-dip galvanized steel product excellent in surface smoothness and formability, having on the steel product surface a zinc alloy plating layer composed of 4 to 22% by mass of Al, 1 to 5% by mass of Mg, up to 0.1% by mass of Ti, up to 0.5% by mass of Si and the balance of Zn and unavoidable
10 impurities, the plating layer of the plated steel product having a metal structure in which an [Mg₂Si phase], an [Al phase] and a [Zn phase] are present in a mixture in the matrix of an [Al/Zn/Zn₂Mg ternary eutectic structure], and the plating layer containing a Ti-Al base intermetallic
15 compound in one or two of the [Al phase] and [Zn phase].

5. A highly corrosion-resistant hot-dip galvanized steel product excellent in surface smoothness and formability, wherein the Ti-Al base intermetallic compound according to any one of claims 1 to 4 is TiAl₃.

20 6. A highly corrosion-resistant hot-dip galvanized steel product excellent in surface smoothness and formability, wherein the Ti-Al base intermetallic compound according to any one of claims 1 to 4 is Ti(Al_{1-x}Si_x)₃ (wherein X = 0 to 0.5).

25 7. The highly corrosion-resistant hot-dip galvanized steel product excellent in surface smoothness and formability according to any one of claims 1 to 6, wherein the Ti-Al base intermetallic compound contained in an [Al phase] in the plating layer is present in a Zn-Al eutectoid reaction structure in which Zn phases are
30 condensed.

8. The highly corrosion-resistant hot-dip galvanized steel product excellent in surface smoothness and formability according to any one of claims 1 to 7,
35 wherein the size of a dendrite in an [Al phase] in the plating layer is up to 500 μm.

9. A process for producing the highly corrosion-

resistant hot-dip galvanized steel product excellent in surface smoothness and formability according to any one of claims 1 to 8, comprising the step of adding a Ti-Zn base intermetallic compound to a plating bath.